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Citation for published version:

Margarit, M, Boroneant, A & Bonsall, C 2021, 'Stone and osseous adornments in the Mesolithic and Early Neolithic of the Iron Gates', *Open Archaeology*, vol. 7, no. 1, pp. 779-797. <https://doi.org/10.1515/opar-2020-0168>

Digital Object Identifier (DOI):

[10.1515/opar-2020-0168](https://doi.org/10.1515/opar-2020-0168)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Publisher's PDF, also known as Version of record

Published In:

Open Archaeology

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Research Article

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Stone and Osseous Adornments in the Mesolithic and Early Neolithic of the Iron Gates

<https://doi.org/10.1515/opar-2020-0168>

received September 14, 2020; accepted June 20, 2021

Abstract: This paper is focused on the various kinds of personal adornments that were used during the Mesolithic and Early Neolithic in the Iron Gates region (southwest Romania). We review how the adornments were used, based on an analysis of their morphology and use-wear, and attempt to identify the sequence of actions involved in their manufacture. We document the changes in ornament type and technique that occurred between 12700–5600 cal BC, highlighting the fact that some “Mesolithic” types continued to be used in the Early Neolithic alongside the introduction of new types reflecting the arrival and integration into the region of a new population with different cultural traditions.

Keywords: Mesolithic, Early Neolithic, Iron Gates, personal adornments, cultural change

1 Introduction

Salvage archaeology during the construction periods (1964–1972, 1977–1984) of two hydro dams in the Iron Gates section of the Lower Danube resulted in the identification of over a hundred prehistoric sites. Of these, around fifty sites produced evidence of Mesolithic and/or Early Neolithic occupations spanning the period from ca. 12700 to 5600 cal BC (Figure 1a).

Archaeologists working in the Iron Gates have differed in their use of the term “Mesolithic”. Those active in the 1960s to 1980s often used the term “Epipaleolithic” to describe the pre-farming populations of the Lateglacial and Early Holocene (Boroneanț, 2000) or the Early Holocene only (Srejović, 1969). Since the 1990s, the term “Mesolithic” has gained attention, though some authors still refer to the Lateglacial as “Epipaleolithic” and the Early Holocene as “Mesolithic” (e.g. Borić, 2011). Since there appears to have been no fundamental change in material culture or subsistence behaviour between the Lateglacial and Early Holocene, we prefer to treat the whole of the period from ca. 12700 to 6000 cal BC as “Mesolithic” and

Special Issue: THE EARLY NEOLITHIC OF EUROPE, edited by F. Borrell, I. Clemente, M. Cubas, J. J. Ibáñez, N. Mazzucco, A. Nieto-Espinet, M. Portillo, S. Valenzuela-Lamas, & X. Terradas

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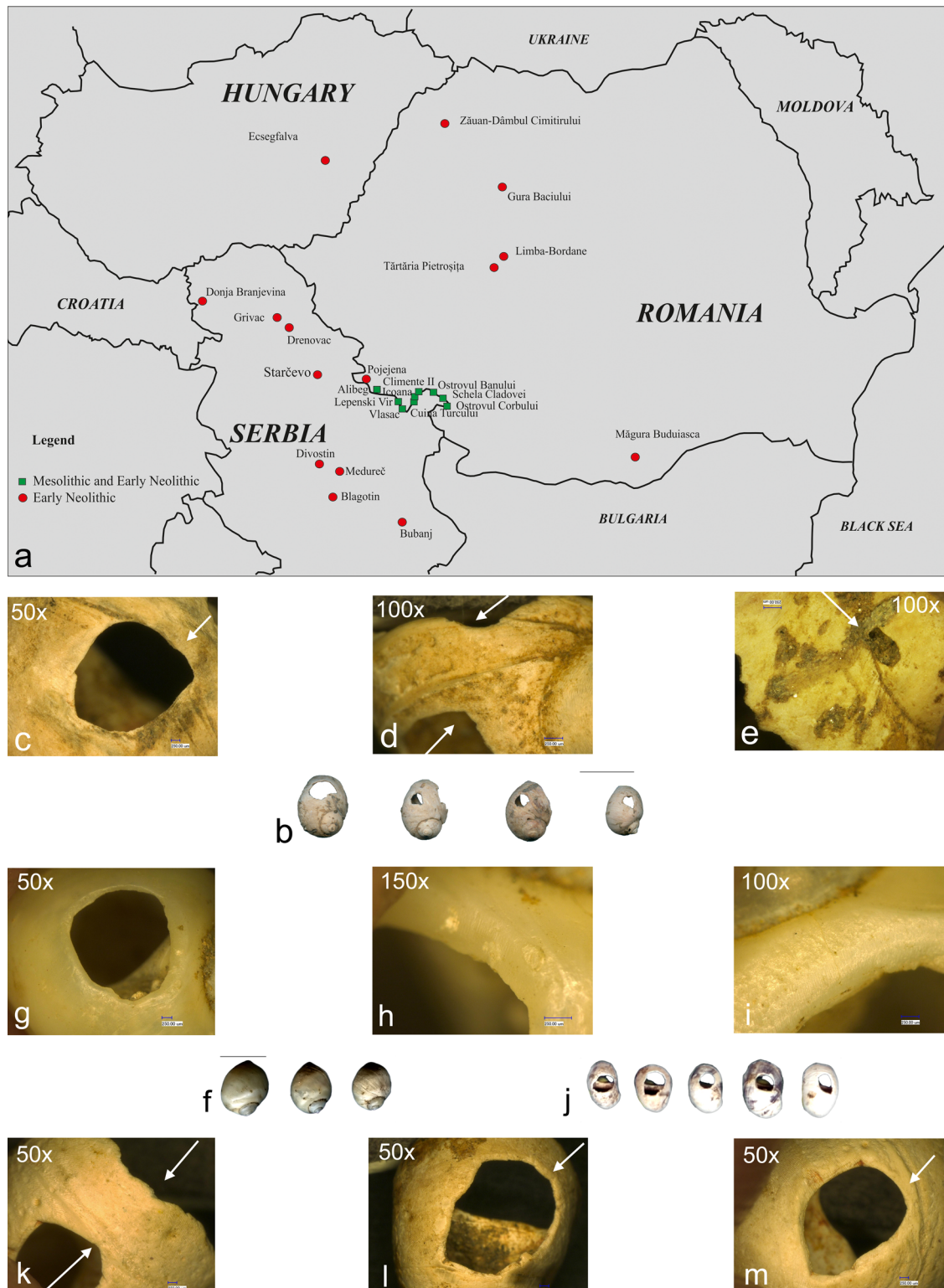


Figure 1: (a) Map of sites with personal adornments in the Iron Gates and surrounding areas of the central and northern Balkans (mentioned in the text); (b) Mesolithic beads made of *Lithoglyphus naticoides* shell (Cuina Turcului) (scale = 1 cm); (c) perforation deformation; (d) aperture deformation; (e) use-wear at the apex; (f) Mesolithic beads made of *Lithoglyphus apertus* shell (Cuina Turcului) (scale = 1 cm); (g) perforation made by abrasion; (h and i) abrasion marks; (j) Mesolithic beads made of *Theodoxus danubialis* shell (Cuina Turcului) (scale = 1 cm); (k) aperture deformation; (l and m) perforation details (f – after Mărgărit, Boroneanț, & Bonsall, 2020).

subdivide it into three main phases based on the palaeoclimatic record: “Early” (12700–9600 cal BC), “Middle” (9600–7300 cal BC), and “Late” (7300–6000 cal BC) (Bonsall & Boroneanţ, 2018, Figure 3).

Evidence of contact with immigrant farmers started to be seen in the Iron Gates after ca. 6200 cal BC, with Neolithic settlements being established in the “downstream area” before 6000 BC and perhaps 50–100 years later in the Iron Gates Gorge. The period of forager-farmer contact in the Iron Gates is variously referred to as “Final Mesolithic” (Bonsall, 2008) or “Mesolithic-Neolithic transformation phase” (Borić, Radović, & Stefanović, 2012). Radiocarbon dates for the Early Neolithic in the Iron Gates, represented by the Starčevo-Criş culture, cluster between ca. 6000 and 5600 cal BC.

The importance of the Iron Gates lies not just in its near-continuous record of Mesolithic and Early Neolithic settlement, but also its variety of well-preserved archaeological evidences, including hut structures, human burials, abundant food remains, and an array of portable artefacts made of stone and hard animal materials.

Although many of the Iron Gates sites are now submerged beneath the reservoirs created by the dams, further excavations have been possible at Vlasac (Borić et al., 2014) and Schela Cladovei (Bonsall et al., 2013), while one new Early Neolithic site has been discovered and investigated at Aria Babi (Borić & Starović, 2006). This later phase of fieldwork together with ongoing archaeometric analyses of finds from the earlier excavations enables archaeologists periodically to review their interpretations of the Mesolithic and Early Neolithic of the region.

Among the many portable artefacts from the Iron Gates sites are examples of personal adornments. Mesolithic personal adornments were made from shells, animal teeth, and pieces of bone and antler that were used as beads and pendants or attached to clothing in the manner of appliqués. In contrast, personal adornments from Early Neolithic contexts typically occur as annular or tubular beads of stone, marine shell, or bone.

In this paper, we review the evidence relating to the production and use of personal adornments based mainly on finds from sites on the Romanian bank of the Danube, the changes that occurred over time, and the significance of those changes in relation to the character and timing of the Neolithic transition in the Iron Gates region.

2 Methods

The individual ornaments were examined macroscopically and microscopically. Microscopic examination and photography were undertaken using a Keyence VHX-600 digital microscope at magnifications between $\times 30$ and $\times 150$. Our methodologies for recording morphological and morphometric attributes and for the analysis of technological and use-wear traces and surface residues were developed with reference to previous studies of body ornaments from prehistoric contexts (e.g. Bonnardin, 2009; Cristiani & Borić, 2012; Cristiani, Živaljević, & Borić, 2014; Falci, Cuisin, Delpuech, van Gijn, & Hofman, 2019; Rigaud, d’Errico, Vanhaeren, & Peñalber, 2014a; Rigaud, Vanhaeren, Queffelec, Le Bourdon, & d’Errico, 2014b; Vanhaeren, d’Errico, van Niekerk, Henshilwood, & Erasmus, 2013). The work of Davies, Powell, and Stanton (1989), Driscoll and Weltin (1973), and Fischer (1995) proved useful in distinguishing between use-wear traces and post-depositional surface alterations of bone and shell.

None of the ornaments available for study has been directly dated. Therefore, period assignments are based on reported archaeological context and associations.

3 Results

The various types of personal adornments recovered from Mesolithic and Early Neolithic sites in the Romanian bank of the Danube are summarised in Table 1.

Table 1: Mesolithic and Early Neolithic personal adornments studied

Chronology	Site	Raw material	Species/raw material type	Typology	No. of pieces			
Early Mesolithic	Climente II [C]	Shell	<i>Antalis</i> sp.	Tubular bead	1			
		Tooth	<i>Vulpes vulpes</i>	Pendant	1			
			<i>Cervus elaphus</i>	Pendant	3			
	Cuina Turcului [R]	Shell	<i>Lithoglyphus naticoides</i>	Bead	37			
			<i>Lithoglyphus apertus</i>	Bead	3			
			<i>Tritia neritea</i>	Bead	3			
			<i>Theodoxus danubialis</i>	Bead	8			
			<i>Zebrina detrita</i>	Bead	1			
			<i>Antalis</i> sp.	Tubular bead	1			
			<i>Cervus elaphus</i>	Pendant	11			
			<i>Sus scrofa</i>	Pendant	1			
		Tooth	<i>Canis lupus</i>	Pendant	1			
			Herbivore	Pendant	1			
			<i>Castor fiber</i>	Pendant	1			
			?	Pendant	1			
			Bone	Fish	Pendant	1		
				?	Pendant	1		
			Antler	<i>Cervus elaphus</i>	Pendant	1		
		Middle Mesolithic		Icoana [O, I]	Tooth	<i>Sus</i> sp.	Flat bead	2
					Shell	<i>Antalis</i> sp.	Tubular bead	1
Middle-Late Mesolithic	Ostrovul Banului [O, I]		Shell		<i>Tritia neritea</i>	Appliqué	20	
		<i>Lithoglyphus apertus</i>	Bead	2				
		<i>Rutilus</i> sp.	Blank	18				
Late Mesolithic	Schela Cladovei [O]	Shell	<i>Lithoglyphus naticoides</i>	Bead	111			
			<i>Tritia neritea</i>	Bead	1			
			<i>Tritia neritea</i>	Appliqué	4			
		Tooth	<i>Rutilus</i> sp.	Appliqué	347			
		Ostrovul Corbului [O, I]	Shell	<i>Columbella rustica</i>	Appliqué	1		
			Tooth	<i>Rutilus</i> sp.	Appliqué	21		
	Final Mesolithic	Alibeg [O]	Stone	Greystone	Cylindrical bead	2		
		Icoana [O]	Tooth	<i>Rutilus</i> sp.	Appliqué	1		
	Early Neolithic	Cuina Turcului [R]	Shell	<i>Lithoglyphus</i> sp.	Pendant	1		
				<i>Theodoxus danubialis</i>	Pendant	1		
<i>Columbella rustica</i>				Pendant	1			
<i>Antalis</i> sp.				Tubular bead	1			
<i>Unio</i> sp.				Pendant (?)	2			
Tooth				<i>Vulpes vulpes</i>	Pendant	1		
				Bone	Fish vertebra	Pendant	1	
					Diaphysis	Cylindrical bead	5	
Diaphysis				Button	3			
Stone				?	Belt element	1		
			?	Various beads	5			
?			?	Cylindrical bead	17			
Schela Cladovei [O]			Greenstone	Malachite, greenschist	Cylindrical bead	>100		

Abbreviations: C = cave, R = rockshelter, O = open-air site, I = island site, (?) = uncertain.

3.1 Shell

The Mesolithic communities of the Iron Gates (Figure 1b and Table 1) used locally available aquatic resources especially *Lithoglyphus naticoides* shells, which were turned into adornments through the perforation of the last whorl. According to Păunescu's field notes, at Cuina Turcului all perforated *Lithoglyphus naticoides* shells were discovered during the 1965 excavation season and came from the same

(“Epipalaeolithic II”) level, suggesting that these shells were part of a composite adornment. Perforated shells of *Lithoglyphus* sp. are also represented in Early Neolithic (Starčevo-Criș) contexts at Cuina Turcului. Common to all examples are the perforation, which appears to have been made by the same technique and the development of the use-wear. The characteristic elements of the perforations are the sub-circular hole which sometimes has slightly irregular edges with a “chipped” appearance and cracks at the points of impact.

Holes with irregular edges in gastropod shells can result from natural impacts, especially among species that inhabit the gravelly beds of fast-flowing rivers. *Lithoglyphus naticoides* (the gravel snail) inhabits slow-flowing rivers, but can be found on soft or stony ground. Also, the convexities of gastropod shells such as the whorls are worn by friction on sand (e.g. Langley & O’Connor, 2015; Smith & Nelson, 2003), which can lead to the development of a perforation. Natural erosion results in an overall polishing of the shells (Dupont, Laporte, Courtaud, Duday, & Gruet, 2014). All these factors were taken into account and a systematic evaluation of the items was performed, starting from the taphonomic alterations that might occur. In the case of the archaeological specimens analysed, we could detect a consistent pattern of perforation morphology, which would tend to exclude natural processes. Moreover, among a natural death assemblage of *L. naticoides* shells, we observed variable patterns of breakage around the margin of the aperture, similar to those noted in some other studies (e.g. Rigaud et al., 2014b).

Experimental studies (Lazăr, Mărgărit, & Radu, 2018; Mărgărit, 2016; Mărgărit, Radu, Boroneanț, & Bonsall, 2018b) suggest that indirect percussion was used to perforate the shells. We identified two distinct areas of use-wear. The first occurs between the perforation and the aperture edge and was caused by friction against a thread. The perforation became strongly deformed toward the aperture, developing a concavity with smoothed walls (Figure 1c). On the aperture, the wall has various morphologies dictated by the intensity of the use-wear (Figure 1d). The second area with use-wear traces occurs on the body of the shell between the perforation and the apex. The surface became smooth, with a macroscopic polish. In several cases, a small hole was noted below the apex (Figure 1e). The use-wear developed as a consequence of the way the thread was attached, as the bead came into contact with the adjacent beads (hitting and rubbing against one another) at the level of the apex.

The *Lithoglyphus apertus* shells from Cuina Turcului (Figure 1f) were perforated by another technique, namely abrasion (Figure 1g). Around the orifice was observed a flat surface covered by parallel fine scratches (Figure 1h and i). The wear was not so well-developed – the abrasion area was not associated with deformation of the perforation. In contrast, the two shells of *Lithoglyphus apertus* from Ostrovul Banului have perforations with irregular sub-rectangular holes. The edges of the perforations had a faceted aspect illustrating the use of indirect percussion. The perforation is deformed toward the aperture, having smoothed walls and macroscopic polish. Also, the morphology of the aperture was distorted by thread pressure, becoming concave.

The technological observations on the *L. naticoides* shells also apply to the *Theodoxus danubialis* shells (e.g. irregular holes and points of impact) (Figure 1j). This species is present in both the Mesolithic and Neolithic levels at Cuina Turcului, and it seems that indirect percussion was the perforation technique used in both periods. The perforations and apertures were similarly heavily deformed by thread pressure reflecting long-term use of the shells (Figure 1k–m).

The *Tritia neritea* shells (only recorded from Mesolithic contexts) were also perforated by indirect percussion at Cuina Turcului (Figure 2a) and Schela Cladovei. The perforations have similar characteristics to those in the *L. naticoides* shells. Accentuated use-wear, strongly deforming the perforation toward the aperture, was noted (Figure 2b–d). Some *T. neritea* shells from Schela Cladovei (Figure 2e) and Ostrovul Banului were modified for use as *appliqués* (cf. Cristiani & Borić, 2012) that were probably sewn onto clothing. Experimental studies have shown that to obtain this special form, pressure was employed to remove the walls of the whorls and the apex (see also Cristiani & Borić, 2012). Microchipping (Figure 2f) is visible on the outer surface of the perforation. The pieces are heavily worn, resulting in thinning of the aperture wall and the development of a concavity (Figure 2g). The surfaces of the apex and spiral walls are flattened and exhibit a macroscopic polish (Figure 2h), possibly resulting from friction against clothing.

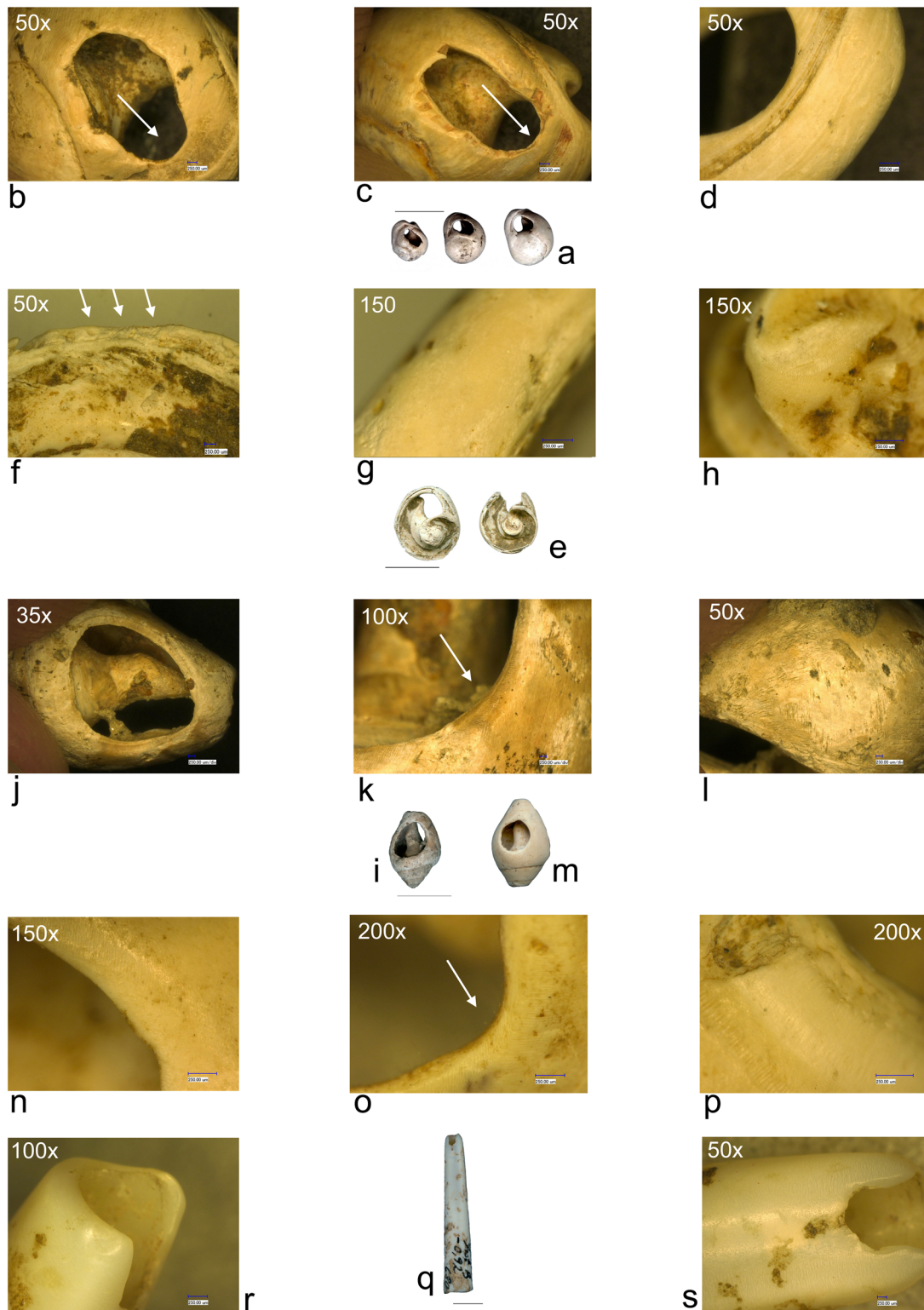


Figure 2: (a) Mesolithic beads made of *Tritia neritea* shell (Cuina Turcului) (scale = 1 cm); (b and c) details of the perforations; (d) perforation deformation; (e) Mesolithic *appliqués* made of *Tritia neritea* shell (Schela Cladovei) (scale = 1 cm); (f) breaking by pressure; (g) aperture deformation; (h) macroscopic polish; (i) Mesolithic bead made of *Columbella rustica* (Ostrovul Corbului) (scale = 1 cm); (j) perforation deformation; (k) perforation deformation; (l) flattened surface; (m) Neolithic bead made of *Columbella rustica* (Cuina Turcului) (scale = 1 cm); (n) perforation detail; (o) perforation deformation; (p) use-wear at the apex; (q) Neolithic tubular bead made of *Antalis* sp. shell (Cuina Turcului) (scale = 1 cm); (r) extremity detail; (s) flattened facet. (a and m–s – after Mărgărit et al., 2020).

A perforated *Columbella rustica* shell was found with a Late Mesolithic burial at Ostrovul Corbului (Figure 2i). The only technological intervention is the perforation for suspension. The perforation has a rounded morphology (Figure 2j) without any manufacturing marks, suggesting a long period of use. The deformation of the perforation and the smoothed appearance of the walls prevented identification of the perforation technique. The associated wear (Figure 2k) and an area of the shell body with a flattened morphology (Figure 2l) suggest that the piece was sewn onto clothing. This species was also found in the Early Neolithic of Cuina Turcului (Figure 2m) where the shell is similarly heavily worn. The perforation is sub-circular with “flanged” walls and fine striations, which suggests it was achieved by abrasion (Figure 2n). There is also a deformation of the perforation wall in the form of a small concavity (Figure 2o), resulting from thread pressure. The shell apex is fractured and shows intense use-wear polish (Figure 2p).

The *Zebrina detrita* (land snail) shell from the Early Mesolithic of Cuina Turcului was perforated through the last whorl, starting from the inside. The main characteristics are the sub-circular morphology and irregular edges of the perforation, suggesting the use of pressure technique. No use-wear is visible on this specimen.

Tusk shells of *Antalis* spp. have a natural conical shape and a curved profile. The two Mesolithic specimens from Climente II and Cuina Turcului do not have a pronounced conical form, suggesting they were obtained by a segmentation procedure. Two techniques used for the segmentation of tusk shells are known: sawing and bending (Vanhaeren & d’Errico, 2001). The extremities are worn away, obscuring the technique used to produce the beads. The Early Neolithic specimen from Cuina Turcului (Figure 2q) provides more use-wear information. It exhibits extremely advanced use-wear (Figure 2r) on the narrower end, which precludes identification of the segmentation procedure. The tip shows a marked concavity that corresponds with a flattened area (Figure 2s) on the body of the shell exhibiting macroscopic polish, which resulted from use as an adornment and suggests the piece was worn for a long period. The anterior end of the shell appears to have been fractured post-depositionally.

Bivalves (*Unio* sp.) appear for the first time in the Starčevo-Criș levels of Cuina Turcului (Figure 3a). Two valves of *Unio* sp. have a perforation located approximately in the same position, below the umbo. The perforation is sub-circular with an irregular outline (Figure 3c). In places, the perforation edge has a faceted aspect indicating impact points; there are also cracks starting from some of the impact points, suggesting the application of indirect percussion. On one of the valves, a second perforation appears to have been initiated but not finished (Figure 3b), which seems to confirm the use of indirect percussion. Experiments on modern specimens (Sztancs, Beldiman, Barbu, & Barbu, 2016) suggest indirect percussion was applied bilaterally and repeatedly to create a perforation with the required dimensions. We could not identify use-wear on the perforation walls of the specimens from Cuina Turcului; hence, their use as pendants is hypothetical.

3.2 Bone and Antler

The bone pendant (Figure 3d) from the Early Mesolithic of Cuina Turcului was made on a flat blank, seemingly obtained by sawing followed by bending, with the segmentation marks (Figure 3e) still visible at both extremities. The external face preserves the original bone morphology. The inner face was regularised by longitudinal scraping (Figure 3f). The perforation was obtained through rotation (Figure 3g), starting from the inner face, resulting in a hole with a conical profile. Specks of red ochre (Figure 3h) are visible on the edges of the perforation and toward the distal extremity.

The debitage procedure used in the case of the flat antler blank from the same (“Epipalaeolithic I”) cultural horizon as the bone pendant (Figure 3i) could not be determined, as all manufacturing traces were erased when the inner surface was scraped (Figure 3j) to make it more regular. At one end, the piece has a perforation made by rotation only (Figure 3k), which started from the outer surface. On this surface is a series of nine parallel oblique lines produced by sawing (Figure 3l). The piece is broken at the opposite end, but four transverse saw marks (Figure 3m) are still visible.

In the case of the catfish (*Silurus glanis*) vertebrae from the Mesolithic (Figure 3n, left) and Starčevo-Criș (Figure 3n, right) horizons at Cuina Turcului, the vertebral spines were detached (Figure 3o). The central

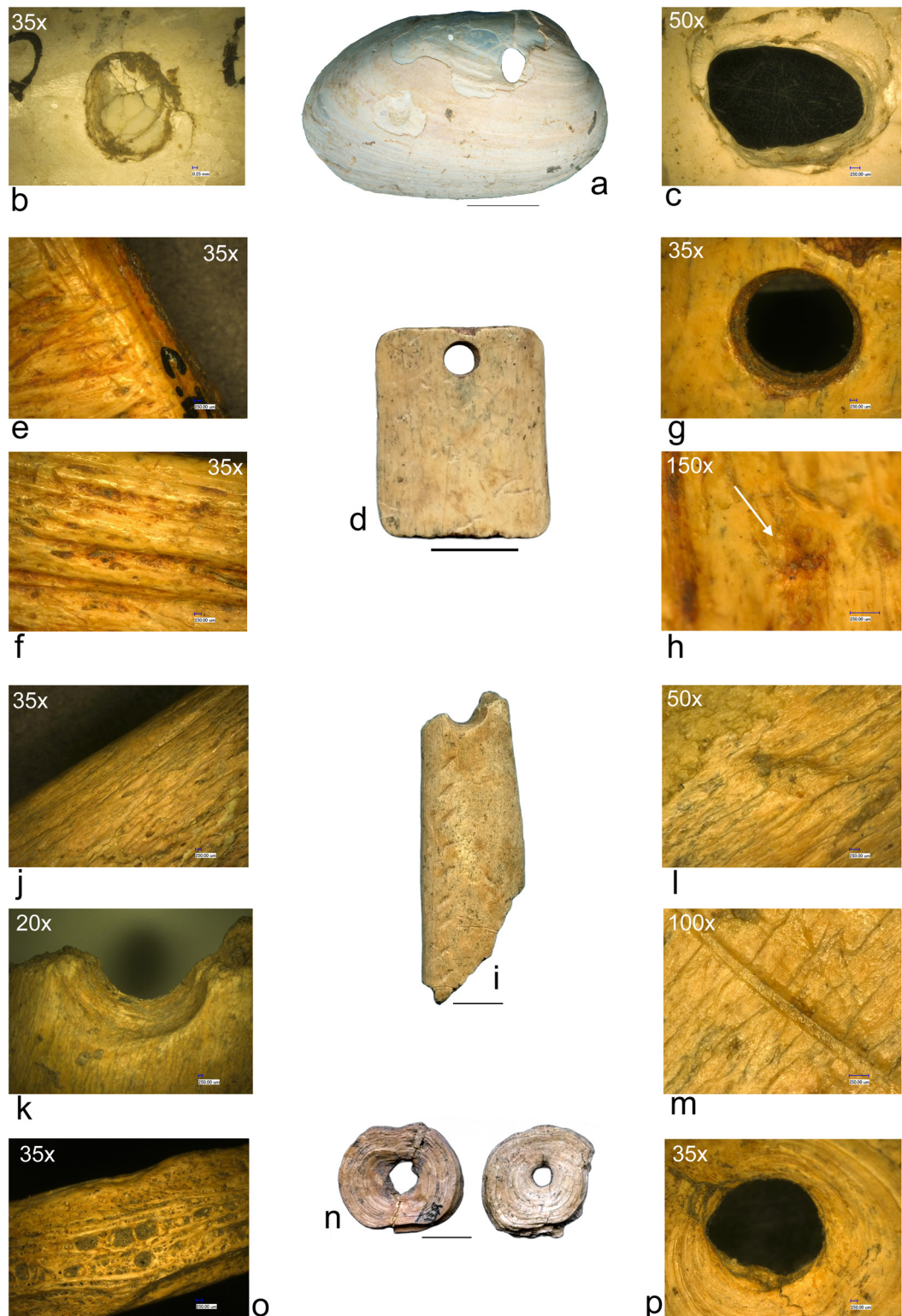


Figure 3: (a) Neolithic perforated *Unio* sp. valve (Cuina Turcului) (scale = 1 cm); (b) unfinished perforation; (c) perforation detail; (d) Mesolithic bone pendant (Cuina Turcului) (scale = 1 cm); (e) sawing marks; (f) scraping marks; (g) perforation details; (h) red ochre specks; (i) Mesolithic antler pendant (Cuina Turcului) (scale = 1 cm); (j) scraping marks; (k) perforation detail; (l and m) decoration details; (n) Mesolithic (left) and Neolithic (right) perforated fish vertebrae (Cuina Turcului) (scale = 1 cm); (o) bending technique; (p) perforation detail (a, c, i and j – after Mărgărit et al., 2020).

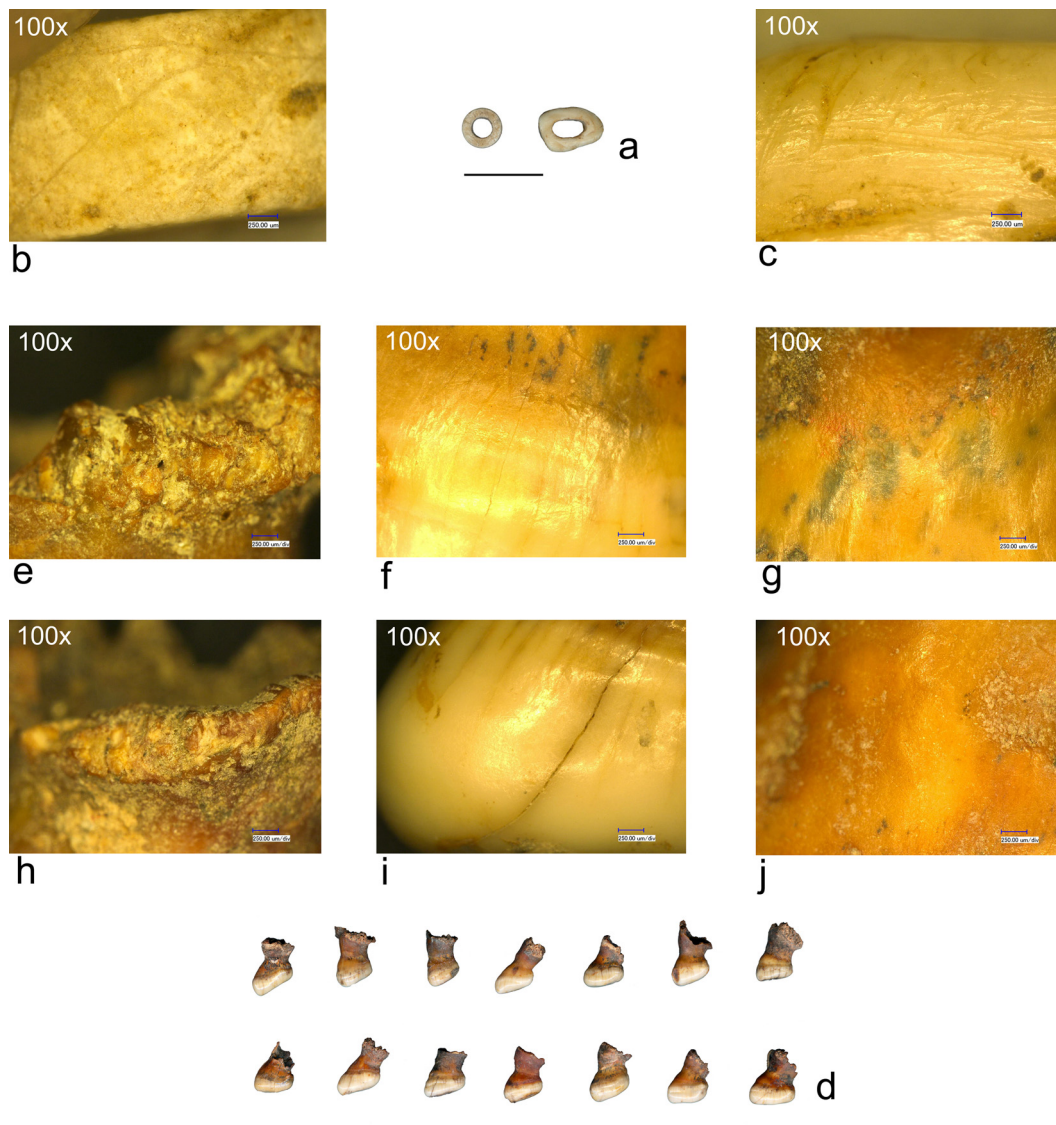


Figure 4: (a) Neolithic bone beads (Cuina Turcului) (scale = 1 cm); (b) abrasion marks; (c) sawing marks; (d) Mesolithic cyprinid teeth (Schela Cladovei) (scale = 1 cm); (e and h) use-wear traces on the fracture edge; (f and i) use-wear traces on the globular body; (g and j) use-wear traces on the neck.

perforation was produced by bifacial rotation. The beginning of use-wear development, in the form of macroscopic polish and fine scratches, is visible on the periphery of the perforation (Figure 3p).

Two bone beads are present in the Early Neolithic assemblage from Cuina Turcului. One is a discoidal bead made on a flat blank (Figure 4a, left), but we were unable to determine the debitage procedures since the rim has been heavily abraded (Figure 4b) to obtain the circular morphology. The perforation was achieved by bifacial rotation. The second piece (Figure 4a, right) was made on a volume blank and has a sub-oval outline reflecting the bone morphology. Segmentation was performed at both ends by sawing (Figure 4c) followed by abrasion of the sawn edges. The medullary channel was used as the perforation.

3.3 Tooth

Pharyngeal teeth of *Rutilus* sp. (probably *R. frisii*) were found in burials 38 and 40 at Schela Cladovei (Boroneanț, 1990) (Figure 4d) and in burial 24 at Ostrovul Corbului. For fastening, the natural shape of

the pharyngeal tooth was used opportunistically. No technological interventions are evident, other than those related to the extraction of the tooth from the pharyngeal bone. Tooth extraction was quite easy and was performed either through percussion around the tooth or by bending of the jawbone as experimental studies have shown (Mărgărit et al., 2018b). The teeth show intensive use-wear, reflecting their mode of attachment and use before deposition in the grave. The intensity of the use-wear is variable among the teeth, ranging from “fresh” surfaces, to surfaces with a strong macroscopic polish and the development of a groove with use-wear traces. Analysis of the archaeological finds identified three areas where use-wear developed, which are indicative of the fixing of the teeth (sewn onto cloth/leather) individually. Two of the wear areas occur on only one of the tooth facets, related to friction between the tooth and the garment. The first appears as a fractured edge (Figure 4e and h), gradually acquiring a round shape and displaying macroscopic polish and fine striations. The second occurs on the crown of the tooth (Figure 4f and i) adjacent to the neck and shows the same polish, traces of compression, and fine striations. The third use-wear area is on the neck itself (Figure 4g and j), caused by the fastening of the tooth onto cloth or leather. This area displays striations with differing morphologies covering the entire surface, showing that the thread was first wrapped around the entire circumference of the neck, then sewn. The striations range from fine to deep incisions, likely depending on the duration of the tooth’s life as an ornament or on the characteristics of the fixing thread.

The pharyngeal teeth from Ostrovul Banului are in different stages of extraction from the pharyngeal bone (Mărgărit, Boroneanț, & Bonsall, 2017). In most cases, to remove the bone material, a percussion procedure was applied around the tooth, such that the blank still retains fragments of it. In one case, the use of bending is attested, indicated by a V-shaped fracture at the level of the bending plane. The first method is undoubtedly safer, allowing intact blanks to be obtained. Microscopic analysis identified no wear traces, indicative of the use of the teeth as *appliqués* like those from Vlasac (Cristiani & Borić, 2012) or Schela Cladovei (Mărgărit et al., 2018b).

In the case of the Mesolithic red deer canines from Cuina Turcului and Climente II (Figure 5a), the perforation was made through the root of the tooth. Both unifacial rotation (one example) and bifacial rotation (12 examples) were employed. In eight cases, the perforated area was prepared by longitudinal scraping, the marks of this preparation being visible on the periphery of the perforations, while for a ninth specimen the surface was prepared by removing small splinters. On one item, bifacial longitudinal scraping was used to thin the piece, and that operation was continued until perforation was achieved, the perforation having an elongated form (Figure 5b and c). Two areas with use-wear were observed on the teeth. The first occurs between the side of the tooth and the perforation, which tends to be deformed in this area, while the wall of the perforation was affected by friction with a thread, becoming flattened or even with a slight depression (suggesting more prolonged use) and exhibiting macroscopic polish (Figure 5d–f). The location of this use-wear indicates the canines were suspended in such a way as to produce the most intense wear along the lateral edges, suggesting they were sewn onto clothing. The second area of use-wear occurs on the lobe of the tooth and consists of flattening of the surface (Figure 5g) and the development of a macroscopic polish associated with irregular scratches that are visible under magnification – again, likely the result of friction with clothing.

In the case of the fox (*Vulpes vulpes*) canine from Climente II cave (Figure 5h), the perforation was performed from both sides with preparatory thinning of the perforation area. In the first stage, the area was prepared with small cuts. Then, sawing was applied, creating a groove that is visible at the top of the perforation, on both faces. Finally, the perforation was created by bifacial rotation (Figure 5i). Use-wear developed laterally, identical to the red deer teeth (Figure 5j–k). Interestingly, the only example of a perforated fox tooth identified at Cuina Turcului (Figure 5l) is reportedly from a Starčevo-Criș context. It was perforated in the middle by bifacial rotation (Figure 5m and n). The manufacturing marks are still visible (Figure 5o), suggesting the piece received little use.

In the Mesolithic levels of Cuina Turcului, other pendants made of perforated teeth were discovered. A wild boar lower incisor (Figure 6a) was perforated by bifacial rotation (Figure 6b). The piece had been worn for a long time, so the rotation marks were erased and, at the periphery of the perforation, the surface became flat with fine scratches (Figure 6c). For the wolf incisor (Figure 6d), a more complex procedure was

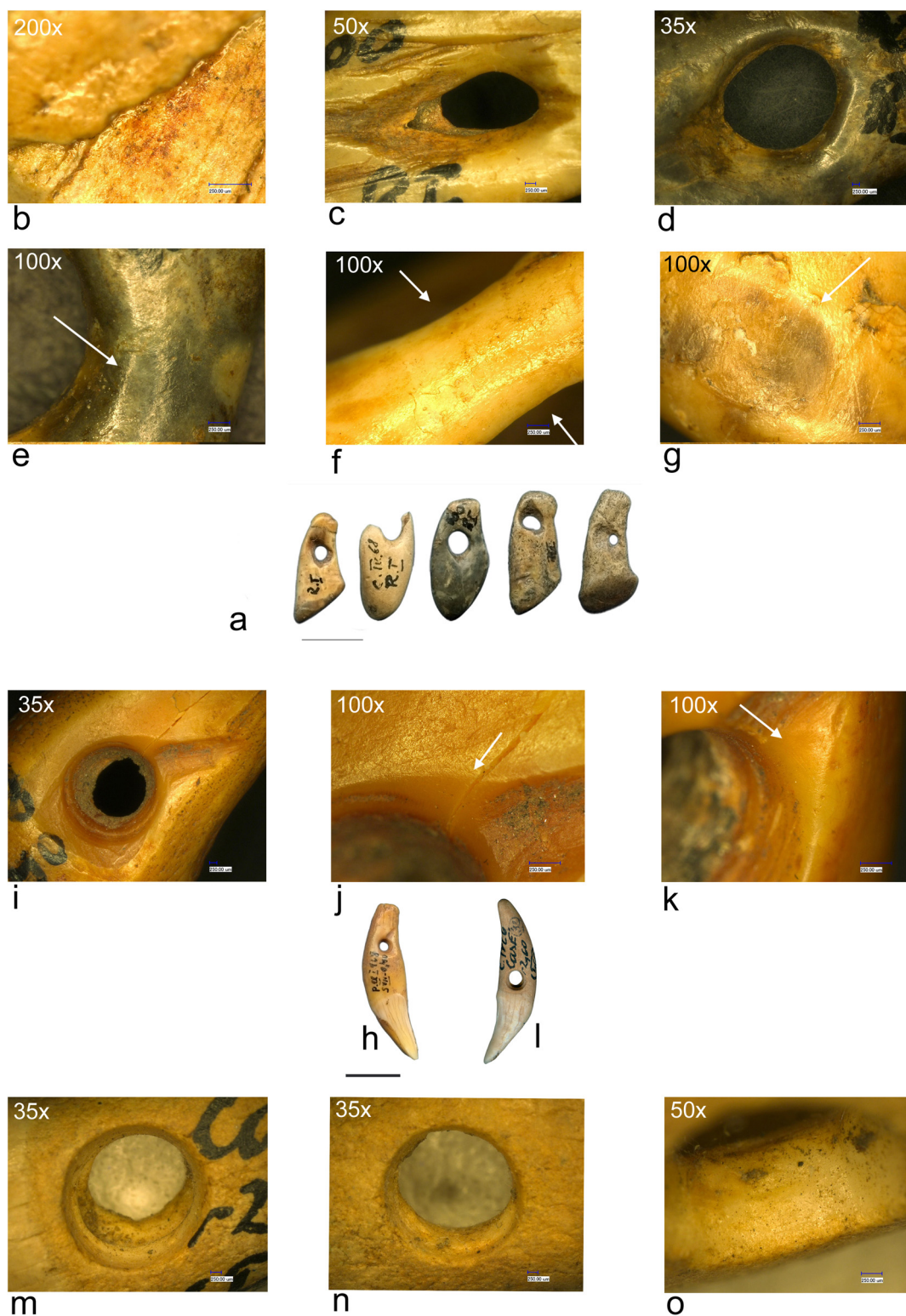


Figure 5: (a) Mesolithic perforated *Cervus elaphus* teeth (Cuina Turcului) (scale = 1 cm); (b) scraping marks; (c and d) perforation details; (e and f) use-wear marks at the perforation level; (g) use-wear marks at the crown level; (h) Mesolithic perforated *Vulpes vulpes* tooth (Climente II) (scale = 1 cm); (i) perforation detail; (j and k) use-wear along the perforation; (l) Neolithic perforated *Vulpes vulpes* tooth (Cuina Turcului) (scale = 1 cm); (m–o) perforation details (c, l, m and o – after Mărgărit et al., 2020).

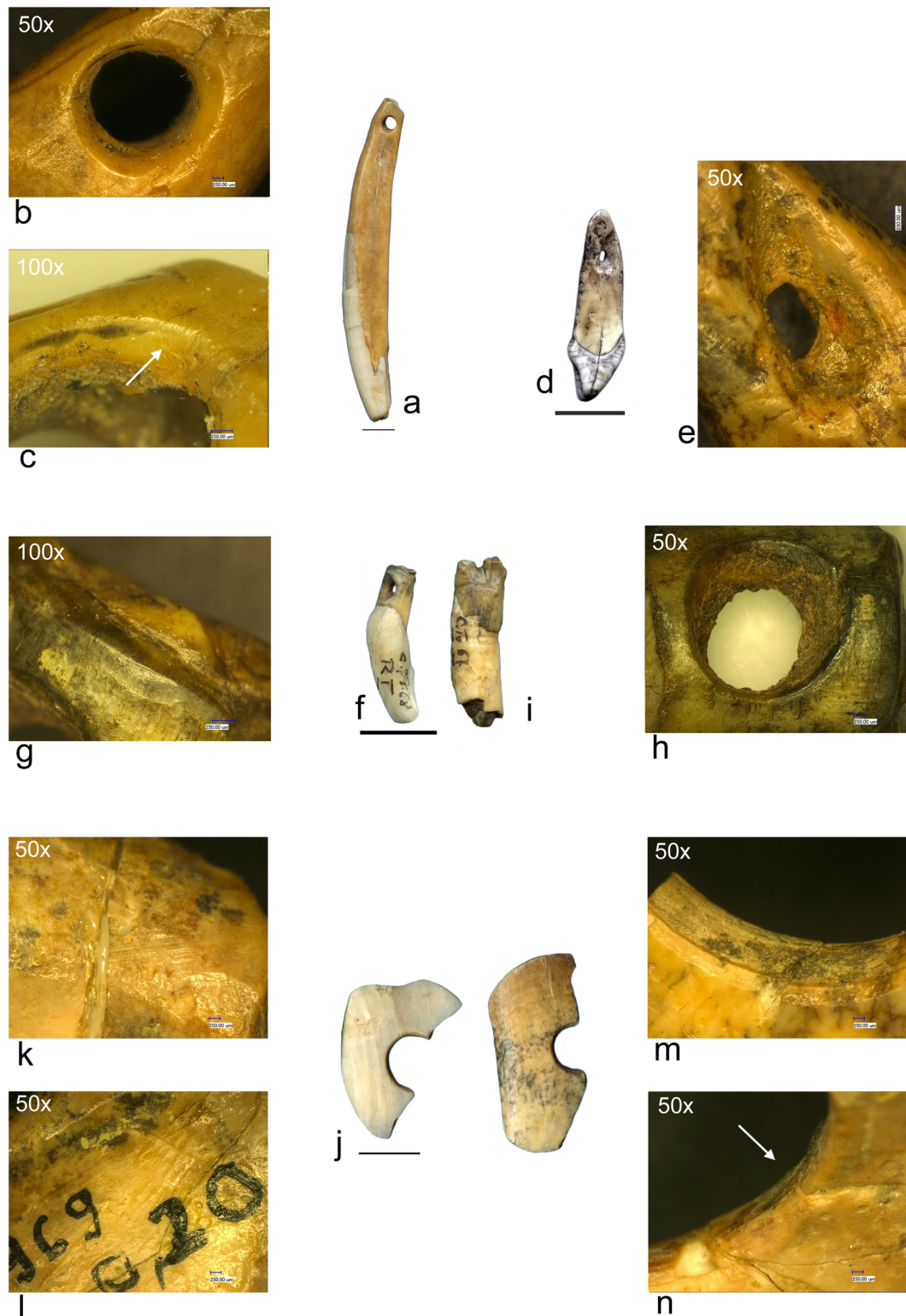


Figure 6: (a) Mesolithic wild boar incisor (Cuina Turcului) (scale = 1 cm); (b and e) perforation detail; (c) wear along the perforation; (d) Mesolithic wolf incisor (Cuina Turcului) (scale = 1 cm); (f) Mesolithic herbivore incisor (Cuina Turcului) (scale = 1 cm); (g) segmentation side; (h) perforation detail; (i) Mesolithic beaver incisor (Cuina Turcului) (scale = 1 cm); (j) Mesolithic flat “beads” made from *Sus scrofa* canines (Icoana) (scale = 1 cm); (k) abrasion of the sides; (l) scraping marks; (m) perforation detail; (n) use-wear adjacent to the perforation (f, g and i – after Mărgărit et al. 2020; l and m – after Mărgărit et al., 2018b).

applied: first thinning of the surface by slightly oblique scraping, thus creating a depression with a small oval perforation (Figure 6e). No use-wear was identified. The herbivore incisor (Figure 6f) was processed in a unique manner: the root was removed by sawing followed by bending (Figure 6g), and the perforation made by bifacial rotation (Figure 6h). For the beaver incisor (Figure 6i), preparation of the perforation was initiated by longitudinal scraping, followed by perforation by rotation. A transverse break across the perforation indicates the latter operation was not finished. The last (indeterminate) tooth is heavily fractured, preserving only a part of a perforation, accomplished most likely by rotation.

The two beads from Icoana (Figure 6j) made from boar canines are unusual for the Mesolithic in that the blanks were obtained by longitudinal splitting of the tooth. The sides were regularised by abrasion (Figure 6k) and thus the precise debitage procedures could not be identified. The beads exhibit a central perforation, performed by bifacial rotation (Figure 6m). The area to be perforated had first been thinned by scraping (Figure 6l). One bead exhibits heavy use-wear, resulting in the obliteration of the rotation striations and a smooth perforation wall (Figure 6n). In the case of the second bead, the striations are still visible, suggesting less intense use.

3.4 Stone

The stone ornaments in our series are probably all from Starčevo-Criș contexts, except for the two beads from Alibeg (Figure 7a) where both Final Mesolithic and Early Neolithic occupations were recognised (Boroneanț, Mărgărit, & Bonsall, 2019). An unpublished AMS ^{14}C measurement on a herbivore bone from the “pithouse” where the beads were found returned a Final Mesolithic date (Boroneanț, Bălășescu, Sava, & Bonsall, forthcoming). The rim and both faces of the beads were regularised by abrasion (Figure 7b and d), while the perforations were produced by bifacial rotation (Figure 7c and e).

Early Neolithic stone ornaments have been published from Cuina Turcului (Păunescu, 1978). Only two were available for analysis. One qualifies as a disc bead or ring (Figure 7f). Both faces of the piece were intensely abraded (Figure 7g), and the central perforation was made by bifacial rotation (Figure 7h). The second item was possibly a belt element (cf. Bonnardin, 2009) made of greenish stone (Figure 7i). The distinctive shape was created by cutting and abrasion (Figure 7j). At one end, two grooves (Figure 7k) were incised on both faces. The perforation has a biconvex profile and was created by bifacial rotation, then enlarged by scraping (Figure 7l).

At Schela Cladovei, numerous malachite and greenschist cylindrical beads were recovered (Figure 7m) together with preforms and debitage waste, indicating *in situ* processing of the beads (Figure 7n and o) (Boroneanț et al., 2019).

4 Discussion

Our analysis of personal adornments from Mesolithic and Early Neolithic contexts in the Iron Gates reveals some interesting diachronic patterns.

Adornments belonging to the Mesolithic before 6300 cal BC have been found at six sites on the Romanian bank – four open-air settlements (Icoana, Ostrovul Banului, Schela Cladovei, Ostrovul Corbului) and two cave/rockshelter sites (Cuina Turcului, Climente II). To these can be added two open-air sites (Vlasac, Kula) on the Serbian bank (Borić & Cristiani, 2019).

A constant feature of the Iron Gates Mesolithic was perforated gastropod shells. These comprised the shells of freshwater, marine and, occasionally, terrestrial species. The freshwater species (*L. naticoides*, *L. apertus*, *T. danubialis*) and the terrestrial snail (*Z. detrita*) were all available locally. The shells of marine gastropods (*T. neritea*, *C. rustica*) likely originated hundreds of kilometres from Iron Gates, probably in the

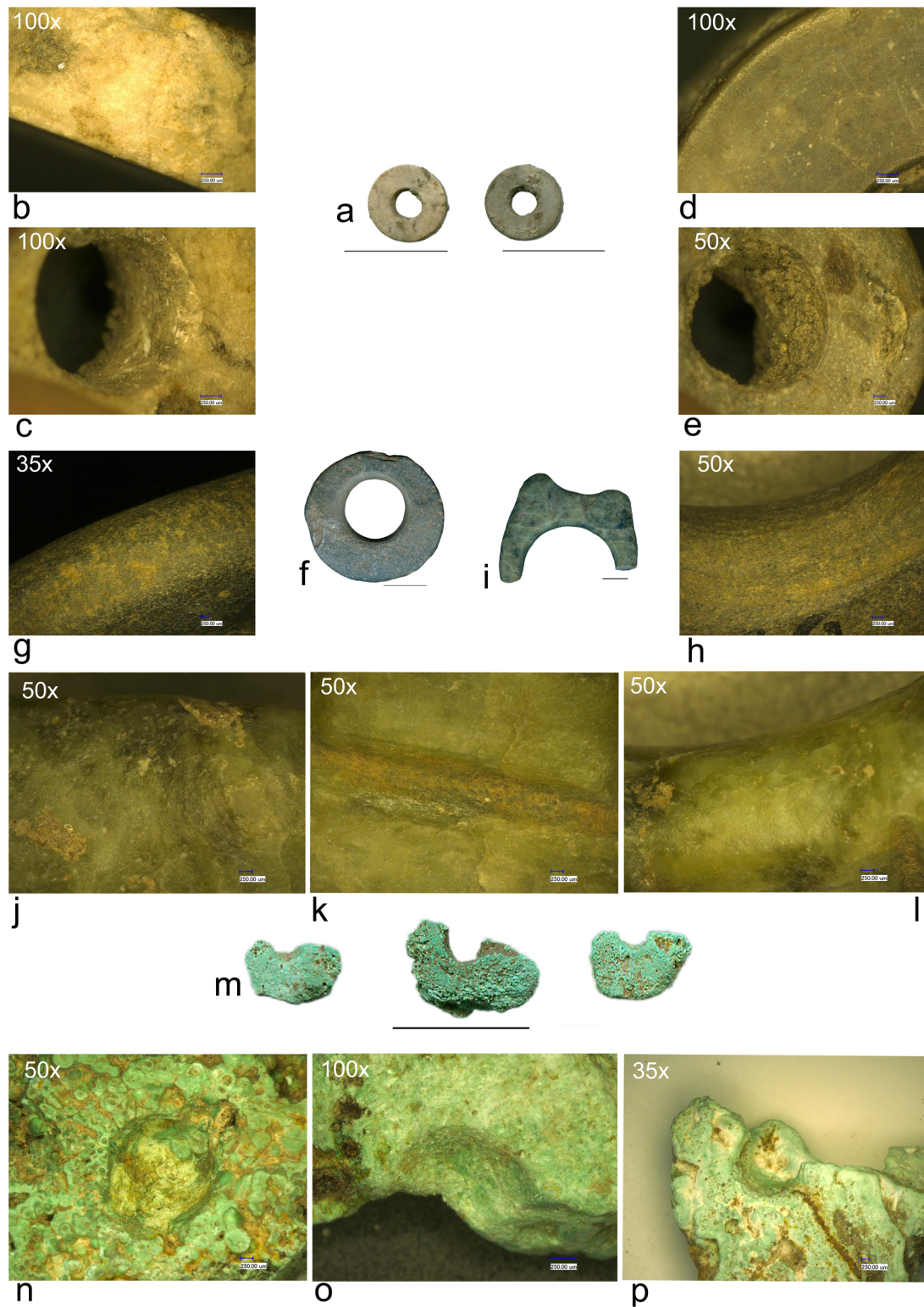


Figure 7: (a) Neolithic stone beads (Alibeg) (scale = 1 cm); (b and d) abrasion marks; (c and e) perforation details; (f) Neolithic stone disc (Cuina Turcului) (scale = 1 cm); (g) edge detail; (h) perforation detail; (i) Neolithic belt element (Cuina Turcului) (scale = 1 cm); (j) abrasion marks; (k) grooving detail; (l) perforation detail; (m) Neolithic malachite preforms (Schela Cladovei) (scale = 1 cm); (n–p) unfinished perforations (f–l – after Mărgărit *et al.*, 2020).

Adriatic – at least during the Early and Middle Mesolithic, since the Black Sea was probably not reconnected to the Mediterranean until ca. 7000 cal BC (Giosan, Filip, & Constantinescu, 2009).

The provenance of the “Dentalium” tusk shell (*Antalis* sp.) beads from Early and Middle Mesolithic contexts is less certain. Empty tusk shells can be found on beaches around the Mediterranean (though not the Black Sea) and beads made from segments of tusk shells occur in Mesolithic sites in the Aegean, mainland Greece, and along the Eastern Adriatic facade (Borić & Cristiani, 2019; Perlès, 2018). However, tusk shells also occur as fossils in Tertiary sedimentary rocks near Orșova in the Romanian Iron Gates (Mărgărit et al., 2020), and so the shells found at Cuina Turcului, Climente II, and Icoana may have been sourced locally.

Mammal teeth transformed into ornaments are well-represented in Early Mesolithic (Lateglacial) contexts in the Iron Gates. They include 14 examples of red deer vestigial canines, all perforated for suspension. Though not reported from Middle Mesolithic or Late Mesolithic contexts in the Iron Gates, perforated deer canines are known from contemporaneous sites in Greece and the Eastern Adriatic (Borić & Cristiani, 2019). Among North American Plains, Indians deer canines were worn attached to garments, invariably by women (Wood, 1957), though among other tribes they were sometimes used in necklaces or attached to bags by both men and women. In Late Neolithic burials on the Pannonian Plain, real and imitation canine tooth beads have been found made into belts, bracelets, and necklaces associated with both females and males (Choyke, 1999). Use-wear development on the Early Mesolithic examples from Cuina Turcului and Climente II suggests they, at least, were worn sewn onto garments.

A distinctive type of ornament in the Iron Gates Mesolithic is represented by the pharyngeal teeth of *Rutilus frisii* (Black Sea roach). At Schela Cladovei (Mărgărit et al., 2018b), Icoana (Boroneanț & Bonsall, 2016), and Ostrovul Corbului, they occurred in burial contexts dated to the Late or Final Mesolithic. At Ostrovul Banului (Mărgărit et al., 2017), similar pharyngeal teeth were found (though not in a closely datable context), but showed little or no evidence of use. On the opposite (Serbian) bank of the Danube, they were found in Late and Final Mesolithic burials at Vlasac and Kula and recovered from non-burial contexts at Lepenski Vir, Vlasac, and Kula (Borić & Cristiani, 2019). Analysis of wear patterns and residues on the teeth and their placement within burials (Cristiani et al., 2014; Mărgărit et al., 2018b) suggests they were attached to garments using string made from animal sinews. *R. frisii* is a semi-anadromous fish that today inhabit the estuaries and lower reaches of certain rivers draining into the Azov-Black Sea, though not the Danube. However, osteological and aDNA analyses have shown that the species was present in the Iron Gates reach of the Danube during the Early Holocene (Živaljević, Popović, Snoj, & Marić, 2017) and so it is likely that the pharyngeal teeth appliqués found in Late and Final Mesolithic contexts were sourced locally.

Some ornament types that characterised the Iron Gates Mesolithic, notably perforated mollusc shells (*Lithoglyphus naticoides* and *Columbella rustica*), also occur in Early Neolithic contexts. In contrast, *Tritia neritea* shells, which were processed into beads and appliqués on both banks of the Danube during the Late Mesolithic (Borić & Cristiani, 2019; Cristiani & Borić, 2012; Mărgărit et al., 2018b), are no longer found in the Early Neolithic. It is also worth mentioning that cyprinid pharyngeal teeth have been recovered in large numbers from Early Neolithic contexts in ongoing excavations at Schela Cladovei (Mărgărit et al., 2018b), although these have not yet been studied to determine if they show wear traces indicative of use as appliqués.

A novel feature of the Early Neolithic in the Iron Gates is the use of shells of bivalve molluscs. Perforated shells of freshwater mussels (*Unio* sp.), which could have been obtained locally, occur at Cuina Turcului (Mărgărit et al., 2020) and Schela Cladovei (Pickard, Boroneanț, & Bonsall, 2017). *Unio* shell pendants have been described from Neolithic sites elsewhere in Romania (e.g. Bărbat, Mărgărit, & Barbu, 2020; Beldiman & Sztancs, 2013; Luca, 1995), though the technique of perforation varied (Mărgărit, Mirea, & Radu, 2018a).

Ornaments made from mammal teeth, which were well-represented in Mesolithic contexts in the Iron Gates, are uncommon in the Early Neolithic and are only occasionally found in the Early Neolithic of Romania beyond the Iron Gates (e.g. Beldiman & Sztancs, 2009).

In addition to the presence of perforated *Unio* sp. bivalve shells, the Early Neolithic in the Romanian Iron Gates is distinguished by the occurrence of discoidal and cylindrical beads of stone and other materials. These find analogues on the Serbian bank at Lepenski Vir (Borić, 2016; Srejović, 1969) and Vlasac (Borić et al., 2014) and in Early Neolithic (Starčevo-Körös-Criș) sites in the central and northern Balkans

beyond the Iron Gates (Figure 1a; for review, see Boroneanț *et al.*, 2019). These new ornament types represent a tradition that originated in the Near East. They are known from the Late Natufian (ca. 11000–9500 cal BC) of the Levant (Bar-Yosef Mayer & Porat, 2008), in Syria (e.g. Tell Mureybet) ca. 10200–10000 BC (Alarashi, 2014), and in Anatolia in the late 9th millennium BC (Baysal, 2013). From there, they spread through Southeast Europe with the first farmers and are widespread finds on Early Neolithic sites throughout the Balkans.

In the Iron Gates, perforated flat “beads” or pendants made of tabular blanks split from boar tusks occur in the Middle Mesolithic of Icoana (Figure 6j), but these differ in style and technique from Early Neolithic discoidal beads. The earliest appearance of true disc-shaped beads is in Final Mesolithic contexts at Lepenski Vir and Vlasac on the Serbian bank of the Danube and, possibly, Alibeg on the Romanian bank. At the Serbian sites, they occur in Final Mesolithic burials, sometimes in association with barrel-shaped *Spondylus* shell beads. This association of Mesolithic burial rite and Neolithic-style ornaments, with no indication of their local manufacture, is strong evidence of contact with early farmers.

The earliest direct evidence of local production of discoidal beads in the Iron Gates comes from the Early Neolithic at Schela Cladovei, where finished beads have been recovered together with flint microdrills and abundant debitage from bead manufacture.

5 Conclusion

Personal adornments are a sensitive indicator of cultural and demographic changes in the Iron Gates region during the period from 12700 to 5600 cal BC. Perforated whole gastropod shells and mammal teeth are a continuation of much older traditions that date back more than 45,000 years in Europe. Distinctively “Mesolithic” types of adornment appear in the Late Mesolithic of the Iron Gates in the form of marine shell and cyprinid tooth appliques, which occur quite commonly in burials. The appearance of discoidal, cylindrical, and biconical beads of stone, bone, or shell in the Final Mesolithic marks the first contacts with farmers and exchanges of goods and people across the agricultural frontier.

The continuation of Mesolithic elements into the Neolithic reflects population admixture and fusion of traditions – a process that began in the Iron Gates in the Final Mesolithic before 6000 cal BC and was a well-documented feature of Neolithisation in some other regions of Europe, including the Aegean (Perlès & Rigaud, 2020), Iberia (Álvarez Fernández, 2008), and Central Europe (Lenneis, 2007; Rigaud, d’Errico, & Vanhaeren, 2015). As Lenneis (2007, p. 136) remarked, “... traditions cannot survive without people”!

Funding information: The work was financed by the Romanian Ministry of Research and Innovation, CNCS – UEFISCDI, project number PN-III-P1-1.1-TE-2016-0182, within PNCDI III and by a research grant developed with the financial support of the Recurring Donors Fund at the disposal of the Romanian Academy and managed by the “PATRIMONIUM” Foundation GAR-UM-2019-II-2.1-1 (project no. GAR-UM-2019-II-2.1-1/15.10.2019).

Author contributions: All authors have accepted responsibility for the entire content of this manuscript and approved its submission. AB and CB provided archaeological background and identified the assemblages to be studied. MM performed the macroscopic and microscopic study of the personal adornments. All authors contributed equally to the manuscript.

Conflict of interest: The authors state no conflict of interest.

Data availability statement: All data generated or analysed during this study are included in this published article.

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